

Amendment to the Claims

1. - 36. (cancelled).

37. (currently amended) A method for providing an improved surface of a III-V semiconductor at crystal mirror facets for laser cavities, comprising:

providing a wafer comprising a layer of III-V semiconductor material;
in an ambient atmosphere [,] cleaving the wafer to produce ~~a chip or an array~~
with at least one laser emitter having at least one crystal mirror facet, wherein
cleaving the wafer leaves reactive atoms at a site of cleavage;

removing oxides and other surface contaminants formed with the reactive
atoms from the at least one crystal mirror facet by controllably delivering nitrogen
ions with an ion beam ~~by dry etching the at least one crystal mirror facet in an~~
~~environment that includes nitrogen ions in a vacuum and;~~

during after the dry etching step, growing a the step of removing oxides,
forming first nitrides with the reactive atoms on the at least one crystal mirror
facet;

wherein the ~~native nitride layer~~ first nitrides comprise native nitride
compounds, each native nitride compound ~~comprising a~~ including at least one
group III element and nitrogen; and

wherein a majoring of the nitrogen in the native nitride compounds first
nitrides is ~~was~~ supplied during the ~~growing step,~~ and ~~all other atoms in the native~~
~~nitride compounds were present in the at least one crystal mirror facet prior to the~~
~~growing step~~ by controllable delivering of nitrogen with a nitrogen ion beam,
wherein the nitrogen ion beam is operated in an energy ion energy range from 1
to 1000 eV..

38. (currently amended) The method of claim 37, wherein the native
nitride compounds are selected from the group consisting of GaN, InN, Al N,
AlGa_N, InGa_N, InAlGa_N, GaAs_N, InAs_N, AlAs_N, InGaAs_N, AlGaAs_N,
InAlGaAs_N, GaPN, InPN, AlPN, InGaPN, AlGaPN, AlInPN, and AlInGaPN.

39. - 40. (cancelled)

41. (previously presented) The method of claim 37, wherein said all other atoms in the native nitride compounds were present in the layer of III-V semiconductor material prior to the cleaving step.

42. (currently amended) The method of claim 37, comprising the further step of adding ~~a passivation layer~~ at least one or more nitrides ~~in direct contact with~~ on the native nitride layer ~~first nitrides~~.

43. (currently amended) The method of claim 37, wherein the removing step ~~comprises using a substance assisted plasma comprising~~ includes at least one substance from the group consisting of ~~nitrogen~~, hydrogen, ~~argon~~ noble gases, halogen compounds, ammonia and hydrocarbon gases.

44. -45. (cancelled)

46. (currently amended) The method of claim ~~45~~ 37, wherein the nitrogen ~~plasma~~ ion beam comprises nitrogen ~~ions~~ in atomic form.

47. (cancel)

48. (currently amended) The method of claim ~~45~~ 37, wherein the nitrogen ~~plasma~~ ion beam comprises nitrogen ~~ions~~ in molecular form.

49. (currently amended) The method of claim 43, wherein the controllable delivering of nitrogen with a nitrogen ion beam ~~the dry etching is performed with plasma using~~ uses a mixture of nitrogen and another gas, and ~~wherein during the dry etching step,~~ the other gas is gradually replaced by nitrogen until only the nitrogen beam ~~nitrogen plasma~~ remains.

50. (currently amended) The method of claim 43, wherein the ~~dry etching~~ removing step is performed with ~~plasma~~ an ion beam using a gas that is free of nitrogen, and wherein during the ~~dry etching~~ removing step, the gas that is free of nitrogen is gradually replaced by nitrogen until only nitrogen ~~plasma~~ remains.

51. (currently amended) The method of claim 43 ~~49~~, wherein the another gas substance is argon a noble gas.

52. (currently amended) The method of claim 37, wherein the at least one crystal mirror facets facet comprise comprises GaAlAs-InGaAs surfaces which further comprises at least one of Sb and Se.

53. - 55. (cancelled)

56. (currently amended) The method of claim 43 ~~37~~, comprising the further step of adding at least one ~~further~~ film that reduces interface recombination prior to mirror coating.

57. (cancelled)

58. (new) The method of claim 37, wherein forming the first nitrides with the reactive atoms creates a chemically non reactive surface.

59. (new) The method of claim 37, wherein forming the first nitrides with the reactive atoms reduces chemical contamination of the crystal laser facet.

60. (new) The method of claim 37, wherein forming the first nitrides with the reactive atoms reduces oxidation of the crystal laser facet.

61. (new) The method of claim 37, wherein forming the first nitrides with the reactive atoms prevents oxidation of the crystal laser facet.

62. (new) The method of claim 37, wherein forming the first nitrides with the reactive atoms creates a surface having a higher band-gap than that of an original crystal laser facet surface.

63. (new) The method of claim 37, wherein the first nitrides formed with the reactive atoms creates a surface having a reduced interface carrier recombination velocity.

64. (new) The method of claim 42, wherein the at least one or more nitrides even out surface interruptions of the first nitrides formed with the reactive atoms.

64. (new) The method of claim 42, wherein the at least one or more nitrides are formed in vacancies left by the first nitrides formed with the reactive atoms.

65. (new) The method of claim 37, wherein the first nitrides formed with the reactive atoms act as a diffusion barrier.

66. (new) The method of claim 37, wherein the removing step and formation of first nitrides from the reactive atoms create a smoother surface at crystal mirror facets for laser cavities.

67. (new) The method of claim 37, wherein the nitrogen beam is directed to the site of cleavage by varying the incident beam angles from 0.degree. to 90. degree. from an angle normal to the site of cleavage.

68. (new) The method of claim 37, wherein the nitrogen beam is directed to the site of cleavage with reduced ion channeling.

69. (new) The method of claim 37, comprising the further step of forming a dielectric mirror layer on the first nitrides formed with the reactive atoms

70. (new) The method of claim 42, further step of forming a dielectric mirror layer on the one or more nitrides that are formed on the one or more nitrides first nitrides which formed with the reactive atoms.